

# TP1KSMB-FL

## Surface Mount - FlatSuppressX™ Low Clamping Voltage TVS Series -1000 W



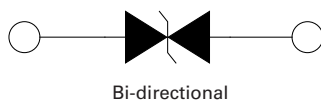
### Maximum Ratings & Thermal Characteristics ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation by 10/1000 $\mu\text{s}$ Waveform (Fig.2)(Note 1), (Note 2) (Note 3)	$P_{PPM}$	1000	W
Power Dissipation on Infinite Heat Sink at $T_L = 50\text{ }^\circ\text{C}$	$P_{M(AV)}$	5.0	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-65 to 150	$^\circ\text{C}$
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	20	$^\circ\text{C/W}$
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	100	$^\circ\text{C/W}$

**Notes:**

1. Non-repetitive current pulse per Fig. 4 and derated above  $T_A = 25\text{ }^\circ\text{C}$  per Fig. 3.
2. Mounted on copper pad area of  $0.31 \times 0.31\text{ }^{\prime\prime}$  ( $8.0 \times 8.0\text{ mm}$ ) to each terminal.
3. Equivalent with conventional 1 kW TVS

### Functional Diagram



## Description

The TP1KSMB-FL is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

## Features

- FlatSuppressX™ TVS provides superior surge protection, maintaining a flat and stable clamping voltage through its advanced foldback I-V characteristics
- High reliability application and automotive grade AEC-Q101 qualified
- 1000 W peak pulse power capability
- For surface mounted applications to optimize board space
- Excellent clamping capability with low clamping voltage
- Low profile package
- Typical failure mode is short from over-specified voltage or current
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- IEC 61000-4-2 ESD 30 kV(Air), 30 kV(Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- $V_{BR} @ T_J = V_{BR} @ 25\text{ }^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$  ( $\alpha T$ : Temperature Coefficient)
- Glass passivated chip junction
- Fast response time: typically less than 1.0 ps from 0 V to  $V_{BR\text{ min}}$
- Low incremental surge resistance
- High temperature soldering guaranteed:  $260\text{ }^\circ\text{C}/10$  seconds at terminals
- UL recognized body that meets flammability rating V-0
- Meet MSL level1, per J-STD-020, high temperature soldering guaranteed
- Matte tin lead-free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2<sup>nd</sup> level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

## Applications

TVS components are ideal for the protection of I/O Interfaces,  $V_{CC}$  bus and other vulnerable circuits used in Automotive electronic applications.

- 48 V battery protection

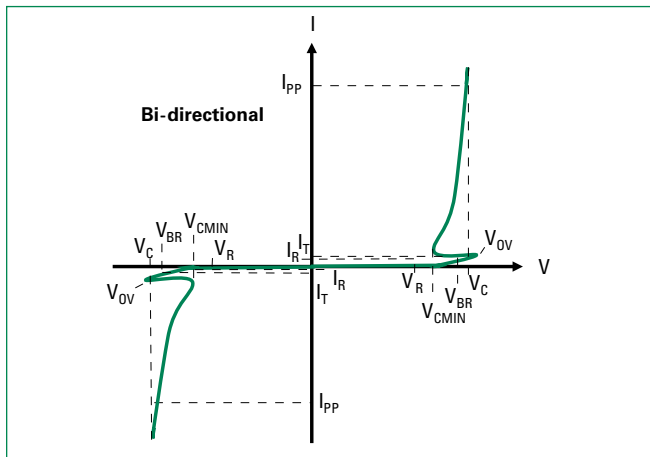
### Electrical Characteristics

Part Number (Bi)	Marking	Reverse Stand off Voltage $V_R$ (V)	Breakdown Voltage $V_{BR}$ (V) @ $I_T$		Test Current $I_T$ (mA)	Overshoot Voltage $V_{OV}$ (V)	Maximum Clamping Voltage $V_C$ (V)	Maximum Peak Pulse Current $I_{PP}$ (A)	Minimum Clamping Voltage @ $0.1 I_{PP}$ (V)	Maximum Reverse Leakage $I_R @ V_R$ ( $\mu\text{A}$ )	Maximum Temperature coefficient of $V_{BR}$ (%/C)
			Min	Max							
TP1KSMB60CA-FL	DKAF	60	66.7	73.7	1	78.6	77.7	10.3	60.7	1	0.08
TP1KSMB64CA-FL	DMAF	64	71.1	78.6	1	81.4	80.0	9.7	62.8	1	0.08

# TP1K5MB-FL

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### I-V Curve Characteristics



- $P_{PPM}$  **Peak Pulse Power Dissipation ( $I_{PP} \times V_C$ )** – Max power dissipation
- $V_R$  **Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation
- $V_{BR}$  **Breakdown Voltage** – Maximum voltage that flows through the TVS at a specified test current ( $I_T$ )
- $V_C$  **Clamping Voltage** – Peak voltage measured across the TVS at a specified  $I_{PPM}$  (peak impulse current)
- $I_R$  **Reverse Leakage Current** – Current measured at  $V_R$
- $V_{OV}$  **Overshoot Voltage**
- $V_{CMIN}$  **Snap Voltage for Bi-directional**

Ratings and Characteristic Curves ( $T_A = 25^\circ C$  unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

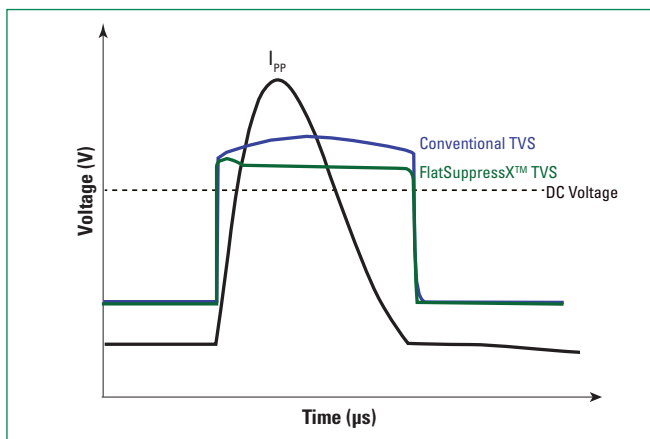


Figure 2 - Peak Pulse Power Rating

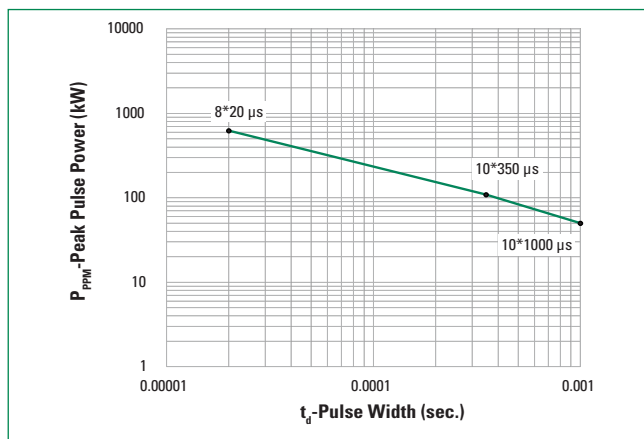


Figure 3 - Peak Pulse Power Derating Curve

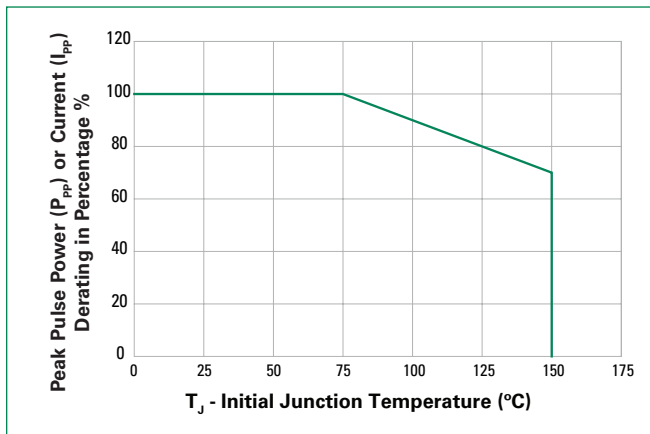
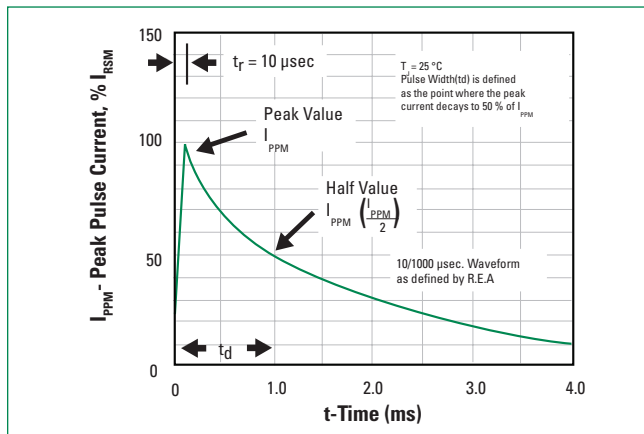
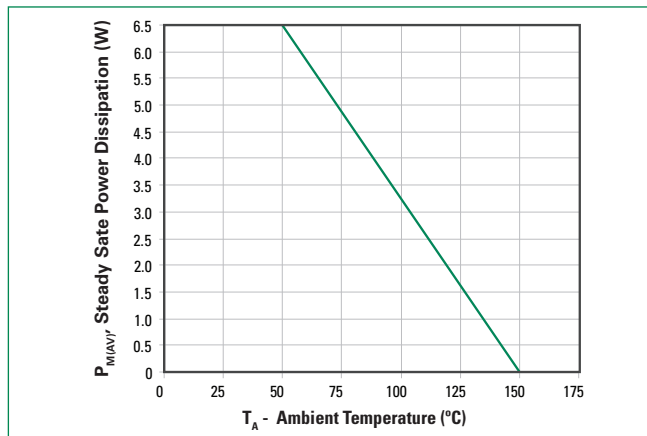


Figure 4 - Pulse Waveform



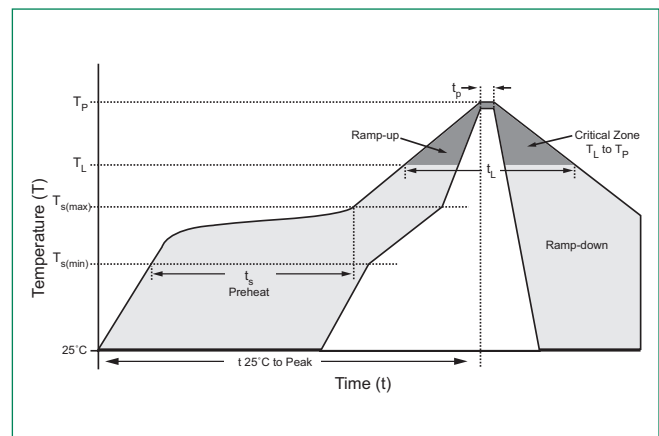
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**Figure 5 - Steady State Power Dissipation Derating Curve**

### Soldering Parameters

<b>Reflow Condition</b>	Lead-free assembly	
<b>Pre Heat</b>	- Temperature Min ( $T_{s(min)}$ )	150 °C
	- Temperature Max ( $T_{s(max)}$ )	200 °C
	- Time (min to max) ( $t_s$ )	60 – 120 seconds
<b>Average Ramp Up Rate (Liquidus temp (<math>T_L</math>) to peak)</b>	3 °C/second max	
<b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>	3 °C/second max	
<b>Reflow</b>	- Temperature ( $T_L$ ) (Liquidus)	217 °C
	- Time (min to max) ( $t_s$ )	60 – 150 seconds
<b>Peak Temperature (<math>T_p</math>)</b>	260 $^{+0/-5}$ °C	
<b>Time within 5 °C of Actual Peak Temperature (<math>t_p</math>)</b>	30 seconds max	
<b>Ramp-down Rate</b>	6 °C/second max	
<b>Time 25 °C to Peak Temperature (<math>T_p</math>)</b>	8 minutes max	
<b>Do Not Exceed</b>	260 °	



### Physical Specifications

<b>Weight</b>	0.003 ounce, 0.093 gram
<b>Case</b>	JEDEC DO214AA. Molded plastic body over glass passivated junction
<b>Terminal</b>	Matte Tin-plated leads, Solderable per JESD22-B102

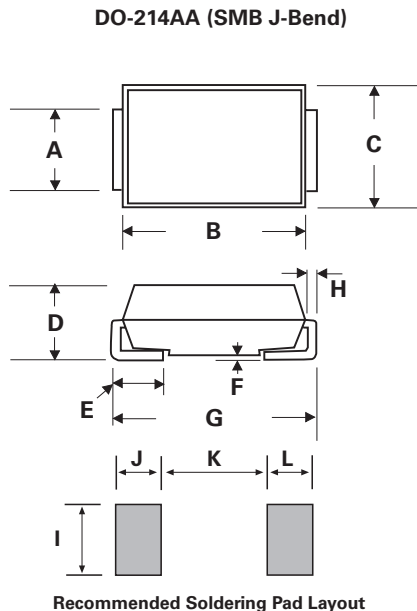
### Environmental Specifications

<b>High Temp Voltage Blocking (HTRB)</b>	100 % DC reverse voltage rated 150 °C, 1008 hours. JEDEC, JESD22-A-108
<b>Biased Temp &amp; Humidity (H3TRB)</b>	80 % breakdown voltage (+85 °C) 85 %RH, 1008 hours. JEDEC, JESD22-A-101
<b>Unbiased Highly Accelerated Stress Test (UHAST)</b>	96 hours at $T_A = 130$ °C/85 %RH. JEDEC, JESD22-A-118
<b>Temp Cycling (TC)</b>	-55 °C to +150 °C, 15 min. dwell, 1000 cycles. JEDEC, JESD22-A104
<b>Moisture Sensitivity Level (MSL)</b>	85 %RH, +85 °C, 168 hours, 3 reflow cycles (+260 °C Peak). JEDEC, JEDEC-J-STD-020, Level 1
<b>Resistance to Solder Heat (RSH)</b>	+260 °C, 30 seconds. JEDEC, JEDEC JESD22-A-111

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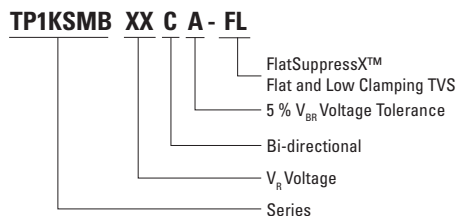
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### Dimensions

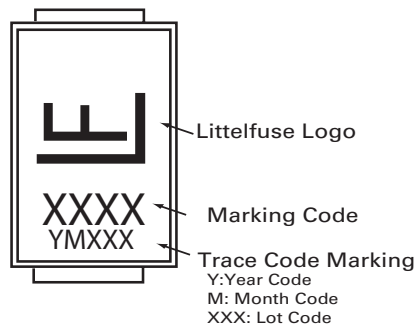


Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.077	0.086	1.950	2.200
B	0.160	0.180	4.060	4.570
C	0.130	0.155	3.300	3.940
D	0.084	0.096	2.130	2.440
E	0.030	0.060	0.760	1.520
F	-	0.008	-	0.203
G	0.205	0.220	5.210	5.590
H	0.006	0.012	0.152	0.305
I	0.089	-	2.260	-
J	0.085	-	2.160	-
K	-	0.107	-	2.740
L	0.085	-	2.160	-

### Part Numbering System



### Part Marking System

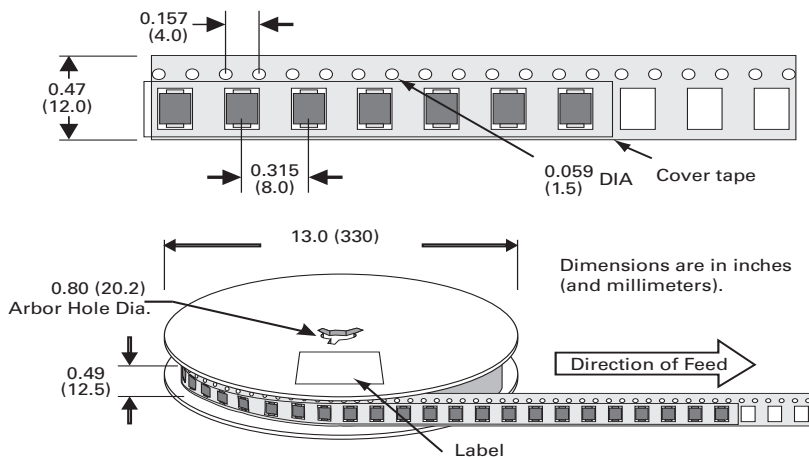


### Packaging

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
TP1KSMBxxCA-FL	DO-214AA	3000	Tape & Reel - 12mm tape/13" reel	EIA STD RS-481

**TP1KSMB-FL**

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**Tape and Reel Specification**

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